

***Myochroidea*, a new genus of corticolous, crustose lichens to accommodate the *Lecidea leprosula* group**

Christian PRINTZEN, Toby SPRIBILLE and Tor TØNSBERG

Abstract: The new lichen genus *Myochroidea* is described to accommodate four species of the *Lecidea leprosula* group. *Myochroidea* is characterized by a crustose, areolate, minutely crenate to almost coralloid or indistinct, grey-brown to olive-brown thallus, reddish brown apothecia with an often persistent margin, moderately branched and anastomosing paraphyses with often swollen, pigmented apical cells, asci of the *Micarea*-type, and colourless, one-celled, fusiform to broadly ellipsoid ascospores. The new combinations *Myochroidea leprosula* (Arnold) Printzen, T. Sprib. & Tønsberg comb. nov., *M. porphyrospoda* (Anzi) Printzen, T. Sprib. & Tønsberg comb. nov., *M. rufofusca* (Anzi) Printzen, T. Sprib. & Tønsberg comb. nov. and the new species *M. minutula* Printzen, T. Sprib. & Tønsberg are published. *Lecidea porphyroplaca* Hinteregger & Poelt is a synonym of *M. rufofusca*. Descriptions of the four species and an identification key are provided. *Myochroidea leprosula* and *M. rufofusca* are reported as new to North America.

Key words: corticolous lichens, Europe, new species, taxonomy, Western North America

Introduction

Lichen species with a crustose thallus and a green-algal photobiont, colourless, non-septate ascospores and apothecia with a true exciple were subsumed under the generic name *Lecidea* Ach. by Zahlbruckner (1925, 1932). It has long been known that these species do not form a monophyletic group, but until now the sheer size of the form genus *Lecidea* (far more than 1000 species in Zahlbruckner's catalogue) has prevented a comprehensive systematic overview of the genus and the assignment of species to more natural groups based on phylogenetic relationships. During the last 40 years, many smaller genera were segregated from *Lecidea*

to accommodate morphologically similar saxicolous species of *Lecidea* (e.g. Hertel 1967, 1969, 1984; Hertel & Leuckert 1969; Hafellner 1984; Brodo & Hertel 1987; Hertel & Rambold 1987, 1990). The phylogenetic relationships within and among these genera, however, have received only little attention (but see e.g., Schmitt *et al.* 2003; Buschbom & Mueller 2004; Andersen & Ekman 2005). There are even fewer systematic studies on the non-saxicolous species of *Lecidea* s. lat. Two genera of largely non-saxicolous *Lecidea* species that were split off (or rather resurrected) in recent years are *Micarea* Fr. and *Biatora* Fr. (e.g., Coppins 1983; Printzen 1995; Printzen & Tønsberg 1999). The phylogenetic relationships within and around these genera were the subject of several DNA-based studies (Ekman & Wedin 2000; Printzen & Lumbsch 2000; Ekman 2001; Andersen & Ekman 2004, 2005). However, taken together, these two genera accommodate little more than 100 species. Otherwise, only few non-saxicolous *Lecidea* species have been assigned to their own genera, and these are often small or monospecific, with

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sometimes unclear circumscription and uncertain phylogenetic position (e.g., Tindal 1984; Hafellner 1993; Kalb 1994; Kantvilas & Elix 1994; Printzen 1999; Hafellner & Türk 2001; Printzen & Kantvilas 2004). We describe here the genus *Myochroidea* to accommodate three former *Lecidea* species and one new species. The close relationship between these species was already recognized by Hinteregger (1994) and Printzen (1995). The species are anatomically very similar and, quite unusual for corticolous, crustose lichens, mainly distinguished by thallus structure (in addition to chemical differences). They also share a similar ecology, often growing on ericaceous shrubs and krummholz conifers in areas with prolonged snow cover.

Material and Methods

This study is based on material from the herbaria B, BG, CANL, COLO, FR, GOET, GZU, H, H-Nyl, M, O, S, UBC, UPS and the private herbaria of Z. Palice and T. Spribille. Specimens were sectioned by hand and sections mounted in water, Lugol's solution or lactophenol cotton blue. Spore measurements were made on sections mounted in water and are given as (smallest single measurement–) *smallest mean–largest mean* (–largest single measurement); measurements of ascotal structures follow Printzen (1995). Lichen substances were identified by TLC (Culbertson & Kristinsson 1970 and later modifications).

The Genus

Myochroidea Printzen, T. Sprib. & Tønsberg, gen. nov.

Thallus crustaceus, myochrous ad argillaceus, areolatus ad granulatus. Apothecia biatorina, porphyrea ad fuliginosa, marginis paullo elevatis. Excipulum interne decoloratum, extra (et prope hymenium) ochraceum ad porphyreum, interdum granulis minutis decoloratis vel ochraceis inspersum. Hymenium, subhymenium, hypotheciumque decolorata. Epihymenium ochraceum ad porphyreum. Paraphyses modice ramosae, apicibus vulgo incrassatis et porphyreis. Asci octospori, typo *Micarea* dicto, ascosporis simplicibus, decoloratis, fusiformibus.

Typus: *Myochroidea rufofusca* (Anzi) Printzen, T. Sprib. & Tønsberg.

Thallus crustose, poorly delimited, warted-areolate or of goniocyst-like granules

in *M. minutula* (see below); areoles weakly to strongly convex or almost coralloid; surface matt, mouse grey to greyish brown or olive-brown; *photobiont* trebouxoid.

Apothecia sessile with a constricted base; disc reddish or blackish brown, rarely ochre, matt or slightly glossy, flat to strongly convex, epruinose or with a very faint pruina (only visible when wet); *margin* biatorine, usually weakly prominent but level with disc or excluded in older apothecia; *exciple* colourless to pale orange-brown within, outer parts more or less concolorous with epihymenium, of strongly gelatinized, branched and anastomosing, radiating hyphae, sometimes interspersed with small, colourless or ochraceous granules; *hypothecium*, *subhymenium* and *hymenium* colourless; *epihymenium* pale ochre to (reddish) brown; *paraphyses* colourless below, weakly to moderately branched and anastomosing, apical cells usually brown and then slightly thickened; *asci* 8-spored, tholus $I_{Lugol} +$ dark blue with a darker staining central tube (resembling the *Micarea*-type); *ascospores* simple, colourless, fusiform or broadly ellipsoid.

Pycnidia not seen.

Chemistry. Secondary metabolites: fatty acids, lobaric acid, xanthenes or no substances.

Etymology. From Greek “myochrous” (mouse-coloured), because of the grey or brown-grey thallus colour.

Remarks. The systematic position of many corticolous species of *Lecidea* s. lat. is still uncertain and so is the position of this new genus. The ascus structure and ascocarp anatomy suggest a relationship with the *Psoraceae*, *Pilocarpaceae* and *Ramalinaceae* or the *Lecidea hypnorum* group. Species of the *L. hypnorum* group are characterized by a *Porpidia*-type instead of a *Micarea*-type ascus, which is typical for *Myochroidea*. Halonate ascospores which are characteristic for species of the *L. hypnorum* group have been observed only in *Myochroidea minutula*. Moreover, *Myochroidea* has weakly pigmented apothecial tissues, whereas species

TABLE 1. Characters distinguishing *Myochroidea* from similar genera and species groups

	<i>Myochroidea</i>	<i>Biatora</i>	<i>Helocarpon</i>	<i>Japewiella</i>	<i>L. hypnorum</i> group	<i>Xyleborus</i>
Exciple	Poorly gelatinized; colourless within	Strongly gelatinized; colourless, weakly brown or greenish in parts	Poorly gelatinized; carbonized	Strongly gelatinized; colourless within	Poorly gelatinized; at least partly dark brown	Strongly gelatinized; dark brown within
Excipular hyphae	Densely branched and entangled; apical cells slightly thickened and brown	Weakly branched and radiating; apical cells ± unthickened and unpigmented	Densely branched and entangled; apical cells ± unthickened	Strongly branched and diverging; apical cells slightly thickened and brown	Weakly branched and radiating; apical cells strongly or weakly thickened, colourless or brown	Weakly branched and radiating; apical cells thickened
Hypothecium	Colourless	Colourless, weakly brown or greenish	Carbonized	Colourless	Dark brown	Dark brown
Ascus	<i>Micarea</i> -type	<i>Biatora</i> -type	<i>Micarea</i> -type	<i>Lecidella</i> -type	<i>Porpidia</i> -type	<i>Micarea</i> -type
Sporodochia	Absent	Absent	Absent	Absent	Absent	Present

around *L. hypnorum* Lib. have a dark hypothecium and/or exciple. Therefore, we assume *Myochroidea* belongs somewhere near the *Pilocarpaceae*. DNA sequence data will be necessary to clarify its systematic position.

Myochroidea is superficially similar to *Biatora* and *Japewiella* Printzen (Printzen 1999). All three genera differ from each other, however, in ascus type and excipular anatomy (Table 1). In *Myochroidea* the exciple consists of densely entangled hyphae with slightly thickened and pigmented apical cells. The excipular hyphae in *Biatora* and

Japewiella are embedded in a gelatinous matrix (especially pronounced in *Japewiella*). Apically thickened and pigmented excipular hyphae are unknown in *Biatora*. *Helocarpon* Fr. and the recently described genus *Xyleborus* R.C.Harris & Ladd (Harris & Ladd 2007) share a *Micarea*-type ascus with *Myochroidea*. *Helocarpon*, however, has a carbonized hypothecium and exciple and apically unthickened excipular hyphae, whereas *Xyleborus* is distinguished by a gelatinous exciple with radiating, weakly branched excipular hyphae and the presence of sporodochia.

Key to the species of *Myochroidea*

- 1 Thallus very thin, dark ochre to olivaceous brown, composed of goniocyst-like structures and appearing as a layer of green algae, no secondary substances **M. minutula**
- Thallus beige or ochre to greyish brown, distinctly areolate or of small, strongly convex warts that may appear minutely coralloid, not appearing as a layer of green algae; fatty acids, lobaric acid or xanthones present 2
- 2(1) Thallus sorediate; UV+ white, containing lobaric acid . . . **M. porphyrospoda**
- Thallus esorediate; UV – or UV+ yellow-orange, lobaric acid absent 3

- 3(2) Areoles 0.05 to 0.10 (–0.15) mm diam., appearing almost coralloid; hymenium and subhymenium with scattered oil droplets, thallus UV –, fatty acids present **M. leprosula**
 Areoles (0.1–) 0.2–0.5 mm diam., often with proliferating, more or less elevated margins but generally not appearing coralloid; hymenium and subhymenium without oil droplets, thallus UV+ yellow-orange, fatty acids absent, xanthonenes present **M. rufofusca**

The Species

Myochroidea leprosula (Arnold)
Printzen, T. Sprib. & Tønsberg, comb. nov.

Biatora leprosula Arnold, Lich. exs. 545 (1874); *Lecidea leprosula* (Arnold) Harm., Bull. Soc. Sci. Nancy, Sér. 2, 33: 63 (1899); type: [Austria:] Tirol, Ötztal, an Zweigen von *Rhododendron ferrugineum* im Zirbenwalde zwischen Gurgl und dem Gurgler Gletscher, 6500 ft, 15 August 1873, Arnold [Lich. exs. 545] (M—lectotypus, designated by Hinteregger 1994; FR, GOET—isolectotypi).

(Fig. 1A & B)

Thallus crustose, poorly delimited, of densely crowded, rarely scattered areoles; areoles more or less isodiametric in outline, 0.05–0.10 (–0.15) mm diam., strongly convex, often slightly crenate to almost coralloid; surface matt, mouse grey to greyish brown; *photobiont* trebouxoid.

Apothecia rounded to slightly deformed or flexuose in outline, mostly single and scattered over the thallus, rarely in groups of 2–3, sessile with a constricted base or more rarely appressed to the thallus, average diameter 0.35–0.50 mm, maximum diameter 0.50–0.85 mm; disc ochre to orange-brown to red-brown, matt or slightly glossy, flat to weakly convex, sometimes with a very thin whitish pruina (only visible when wet); *margin* distinct, but not or only weakly prominent, level with disc or excluded in older apothecia; *exciple* colourless or pale yellow (brown) within, outer parts, especially near hymenium, brown and with minute, colourless, scattered granules, more or less concolorous with epihymenium, laterally 40–100 µm, basally 60–110 µm wide, of strongly gelatinized, branched and anastomosing, radiating hyphae, inner cells

with lumina 1.0–2.5 µm wide, apical cells slightly thickened (lumina 1–3 µm) when pigmented, colourless apical cells near base of exciple generally unthickened; *hypothecium* 70–150 µm high, colourless to weakly yellowish; *subhymenium* 40–95 µm high; *hymenium* 60–75 µm high, colourless; *epihymenium* 12–25 µm high, pale ochre to (reddish) brown, composed of pigmented ends of paraphyses and small, more or less colourless to pale ochre granules, sometimes streaking into the hymenium; *paraphyses* colourless below, relatively easily separated in squash preparations, weakly branched and anastomosing, lumina 0.7–1.5 µm, apically 1–2 µm wide; *ascospores* (9.5–) 10.6–13.0 (–15.5) × (4.0–) 5.1–6.6 (–8.0) µm.

Pycnidia not seen.

Chemistry. Thallus C –, K –, P –; secondary metabolites: 2 fatty acids.

Ascomatal pigments. Epihymenium in water: brown; K: olive-brown; K/HCl: orange-brown; K/HCl/K: olive-brown; N: brilliant orange-brown; N/K: (olive) brown; N/K/HCl: orange-brown; N/K/HCl/K: brown; hymenium in water colourless; N/K: yellow; N/K/HCl: colourless; N/K/HCl/K: yellow.

Remarks. Contrary to the suggestion in the name, *Myochroidea leprosula* is not leprose. Thallus granules are corticate and may possibly be dispersed like isidia. The species often grows together with *M. rufofusca* from which it can be distinguished by the size and shape of its thallus granules (Fig. 1A). *Myochroidea leprosula* can hardly be confused with any other species of *Lecidea* s. lat. The thallus of *Frutidella caesioatra* (Schaer.) Kalb is also composed of minute convex areoles

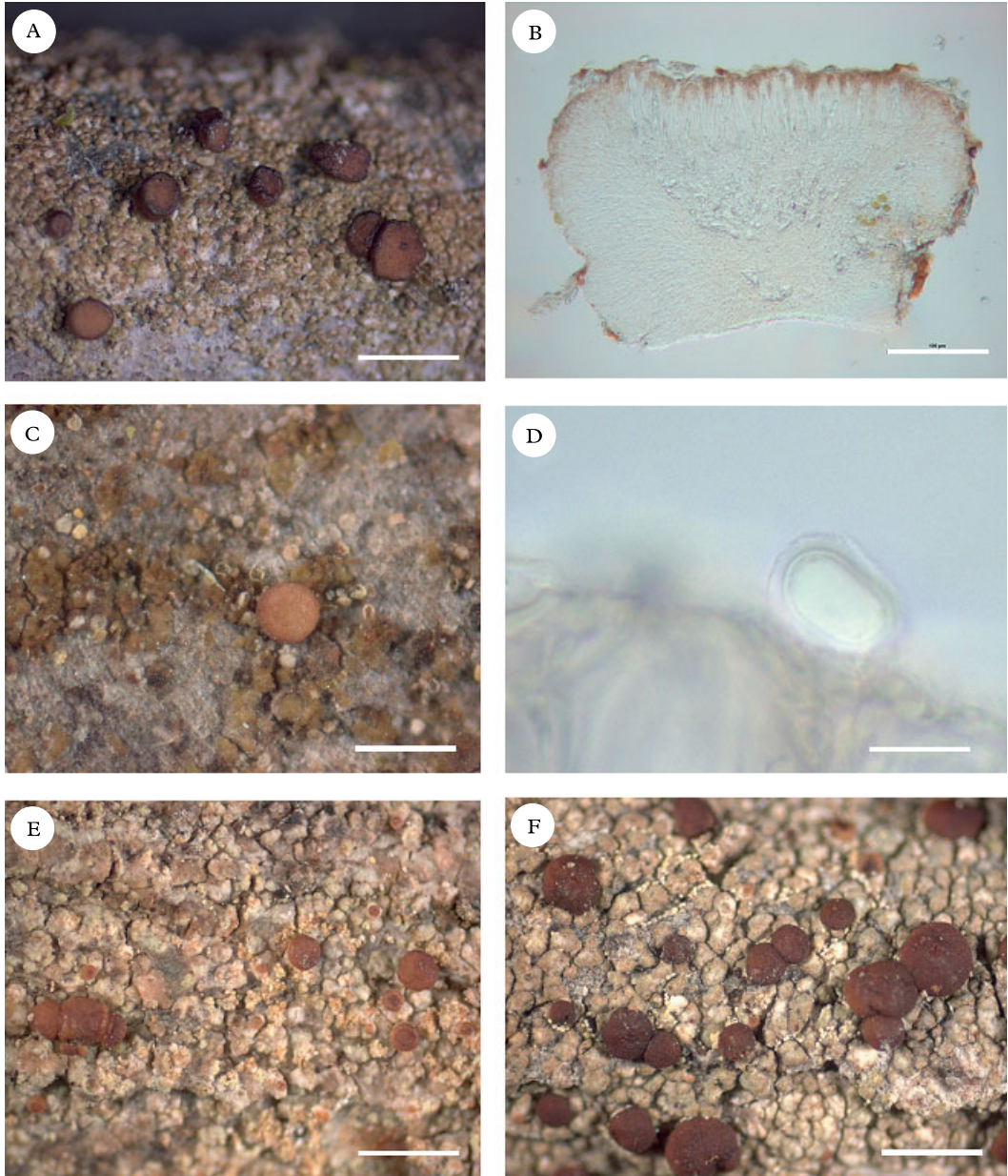


FIG. 1. Species of *Myochroidea*. A, *M. leprosula*, habit; B, *M. leprosula*, section of apothecium; C, *M. minutula*, habit; D, *M. minutula*, young ascospore with gelatinous perispore; E, *M. porphyrospoda*, habit; F, *M. rufofusca*, habit. A & B from *Goward* 05-941, C & D from holotype, E from *Spribille* 22405, F from *Spribille* 19946. Scales: A=1 mm; B=100 μ m; C=0.4 mm; D=10 μ m; E & F=1 mm.

and may appear isidiate. This species is, however, restricted to saxicolous bryophytes (mainly *Andreaea* and *Grimmia* species) in

alpine situations and contains sphaerophorin as a secondary metabolite. *Bacidia subincompta* (Nyl.) Arnold has been suggested to

be externally similar to *M. leprosula* (Hinteregger 1994) and may occur in similar habitats, but it can be instantly distinguished from *M. leprosula* by its blackish apothecia with blue-green pigments, multiseptate, acicular ascospores, a greenish grey thallus and the lack of secondary metabolites. Hinteregger (1994) did not report any secondary metabolites from *M. leprosula*. According to our own studies, the species regularly contains two unidentified fatty acids.

Distribution and ecology. Due to its brownish grey colour, the thallus of *M. leprosula* may be difficult to distinguish from naked bark, and it may be widely overlooked. So far, the species has been reported from Austria and Switzerland (Hinteregger 1994), but may be widespread in other parts of the Alps. Nimis & Martellos (2003) recorded it in Italy but that report seems to be based on collections from Austrian territory close to the Italian border (Martellos & Nimis 2001). In contrast to *M. porphyrospoda* and *M. rufofusca*, *M. leprosula* seems to be absent from Scandinavia. In western North America, *M. leprosula* has so far been found in British Columbia, Montana, Oregon, and Washington, but it is likely to be more common than the few records would seem to indicate. *Myochroidea leprosula* was found corticolous on the bases of stems of *Rhododendron ferrugineum*, *R. albiflorum*, *Menziesia ferruginea*, *Vaccinium membranaceum*, *Pachistima myrsinites*, on branches near the base of *Castanopsis chrysophylla*, and once on bark of *Alnus rubra* close to a small creek and on the bases of dwarf *Abies lasiocarpa* in subalpine snowbed habitats. It seems to prefer shaded and humid habitats in subalpine localities with late snow cover.

Selected specimens examined ($n=22$; for further localities in the Alps see Hinteregger 1994). **Austria:** *Tirol:* Kitzbüheler Alpen, Kleiner Rettenstein ober Passturm, 47°20'N, 12°20'E, on *Rhododendron ferrugineum*, ix 1871, Arnold (M); Ötztaler Alpen, Obergurgl, ridge "Brenner" 1–1.5 km SW of Obergurgl, 46°51'32"N, 11°00'53"E, 2000–2050 m, on *Rhododendron ferrugineum*, 2005, Printzen 9691b (FR).—**Canada:** *British Columbia:* Babine Mountains, Joe L'Orsa Cabin, 54°54.618'N, 126°53.183'W, on bases of dwarfed *Abies lasiocarpa* behind the cabin, 1501 m

elev., 2006, *Spribille* 22367 (CANL); Central Coast, Toba Inlet area, headwaters of Jimmy Creek, 50°29'30"N, 124°02'44"W, corticolous on *Alnus* twig, 1250 m elev., 2007, *C. R. Björk* 14669 (UBC); Comaplix Mountain, 50°51'12"N, 117°41'37"W, 1700–1800 m, 2005, *Spribille* 18280-A & *Pettitt* (hb. *Spribille*); NE of New Denver, Goat Range, Dennis Creek trail, 50°04.889'N 117°19.132'W, on bases of dwarfed *Abies lasiocarpa* along trail, c. 1954 m, 2006, *Spribille* 20022-B & *Wagner* (hb. *Spribille*, mixed with *M. rufofusca*); Purcell Mountains, St. Mary's Alpine Provincial Park, trail to Mortar Lake, 49°51.461'N, 116°25.116'W, on *Rhododendron albiflorum* stalks, 2270 m, 2006, *Spribille* 19946 & *Wagner* (BG, mixed with *M. rufofusca*); Selkirk Mountains, Glacier National Park, Asulkan Trail, oldgrowth Engelmann spruce-subalpine fir forest, rich valley bottom, on *Rhododendron*, 1260 m elev., 2005, *Goward* 05-941 (BG, UBC); Vancouver, Grouse Mountain, along trail to Crown Ridge, 49°22'N, 123°10'W, on *Abies*, 1000–1500 m, 1994, *Aptroot* 34680 (UBC, mixed with *Lecidea pullata*).—**USA:** *Montana:* Lincoln Co., Whitefish Range, Ten Lakes Scenic Area, trail to Wolverine Lake, near 48°58.484'N, 114°54.727'W, on *Vaccinium membranaceum* stalks, 1921 m, 2006, *Spribille* 20334 & *Wagner* (hb. *Spribille*). *Oregon:* Wasco Co., S of Mt Hood, E of State Route 26 at Rd NFD 2640/Camas Prairie Rd intersection, 45°11.7'N, 121°41.4'W, alt. 1060–1070 m, corticolous on branches near base of trunk of *Castanopsis chrysophylla*, 2001, *Tønberg* 29177 (BG). *Washington:* Clallam Co., SSW of Port Angeles, S of Hurricane Hill, along road W of Hurricane Ridge Visitor Center, 1.3 km E of parking lot at end of road, 47°58'N, 123°30'E, 1570 m, on *Rhododendron*, 1994, *Tønberg* 20002 (BG); Olympic Nat. Park, Hurricane Ridge, end of Hurricane Ridge Rd., 47°58'36"N, 123°31'02"W, c. 1550 m, on twigs of *Vaccinium membranaceum*, 1999, *Printzen* 5312 (FR), Lewis Co., Mt Rainier Nat. Park, Reflection Lake W, 46°46'N, 121°44'W, 1470 m, on *Vaccinium*, 1994, *Tønberg* 20316 (BG), Pierce Co., Mt. Rainier Nat. Park, Wonderland Trail N of White River Campground, 46°54'33"N, 121°38'49"W, c. 1650 m, on twigs of *Rhododendron albiflorum*, 1999, *Printzen* 5052 (FR).

***Myochroidea minutula* Printzen, T. Sprib. & Tønberg, sp. nov.**

Species *Myochroidea leprosulae* similis sed thallo tenuiore, atrofulvo ad olivaceo-brunneo, dissolvente in goniocystas et substantias secundarias destituito.

Typus: Canada, British Columbia, Selkirk Mts., W bank of the Incomappleux River opposite to unnamed stream draining glacier S of Battle Brook, 50°59.240'N 117°35.624'W, 706 m, on branches of small diameter (young?) *Tsuga heterophylla* in low elevation, old-growth *Tsuga heterophylla-Thuja plicata* forest, 22 August 2005, *T. Spribille* 17648 & *C. Pettitt* (CANL—holotypus; BG—isotypus).

(Fig. 1C & D)

Thallus crustose, poorly delimited, partly endosubstratal, episubstratal parts of scattered, more rarely more or less contiguous, areoles that dissolve into goniocyst-like structures; areoles very thin, irregular in outline, 0.05–0.10 (–0.20) mm in diam.; surface matt, dark ochre to olive brown, appearing wrinkled and dissolving into goniocysts of 15–30 µm diam.; *photobiont* trebouxoid.

Apothecia rounded, single and scattered over the thallus, sessile with a constricted base, average diameter 0.25 mm, maximum diameter 0.35–0.50 mm; disc beige to light brown, matt, flat; *margin* distinct in young apothecia, but not or only weakly prominent, level with disc or excluded in older apothecia; *exciple* colourless within, outer parts, especially near hymenium, pale brown, more or less concolorous with epihymenium, laterally 40–70 µm, basally 55–140 µm wide, of strongly gelatinized, irregularly branched and anastomosing hyphae, inner cells with lumina 1–2 µm and lumina of apical cells 1–1.5 µm wide; *hypothecium* 75–125 µm high, colourless to weakly yellowish; *subhymenium* 25–35 µm high; *hymenium* 50–55 µm high, colourless; *epihymenium* 0–10 µm high, ochre to pale brown, composed of amorphous pigment around apical cells of the paraphyses, partly streaking into hymenium; *paraphyses* colourless, conglutinate in squash preparations, weakly branched and anastomosing, lumina c. 1 µm, apically 1–2 µm wide; *ascospores* (9.0–) 11.5–12.5 (–14.5) × (4.5–) 5.5–6.5 (–7.0) µm, sometimes with gelatinous perispore.

Pycnidia not seen.

Chemistry. Thallus C –, K –, P –; no secondary metabolites detected by TLC.

Remarks. *Myochroidea minutula* is easily distinguished from the other *Myochroidea* species on account of its largely endosubstratal thallus, episubstratal parts of which dissolve into goniocysts (Fig. 1C). Sterile thalli of *M. minutula* are potentially indistinguishable from several species of *Micarea*, including members of the *M. prasina* and

M. synotheoides groups. Fertile specimens of these species, however, are distinguished by a poorly developed exciple, more strongly branched paraphyses and narrower ascospores that are mostly septate. Fertile specimens of *M. minutula* may give the impression of a diminutive gyalectoid lichen but any relationship to *Gyalectaceae* is dispelled upon finding simple ascospores.

Distribution and ecology. *Myochroidea minutula* is currently known only from the type locality in a low elevation, old-growth inland rainforest (the ‘Incomappleux rainforest’) in the Selkirk Mountains of south-eastern British Columbia. Here it was found on the bark of small *Tsuga heterophylla* trees regenerating in a forest stand estimated at 700–1000 years old (C. Pettitt, pers. comm.). It is apparently rare at this site, as a wide range of substrata have been surveyed in the Incomappleux River drainage since 2002 (T. Spribille, unpublished), and the species has not been found on *Acer*, *Corylus*, *Thuja*, *Vaccinium*, or even mature *Tsuga heterophylla*, otherwise the most common substrata in this forest.

Additional specimen examined. **Canada:** British Columbia: same locality as type, on bark of lower trunk of small diameter (young?) *Tsuga heterophylla*, 2005, Spribille 17656 & Pettitt (hb. Spribille—paratype).

***Myochroidea porphyrospoda* (Anzi) Printzen, T. Sprib. & Tønsberg, comb. nov.**

Biatora porphyrospoda Anzi, *Comment. Soc. Crittog. Ital.* 2: 13 (1864); *Lecidea porphyrospoda* (Anzi) Th. Fr., *Lichenogr. scand.* 2: 463 (1874); type: Italy, Lombardia, in alpe Camsciano sopra Poschiavo, in calce truncorum Laricinarum, [Anzi, *Lich. Lang. exs.* 339] (M—lectotypus, designated here; FR—isolectotypus).

(Fig. 1E)

Thallus crustose, poorly delimited, non-sorediate parts made up of scattered to coalescing areoles; areoles irregular in outline, (0.05–) 0.10–0.30 mm diam., weakly to strongly convex, often crenate; surface matt, beige or ochre to greyish brown; soralia very irregular in outline, 0.4–1.0 mm diam. but

poorly delimited, white in inner parts, brown in outer parts, often coalescing to form a more or less leprose crust; *photobiont* trebouxoid.

Apothecia rounded to tuberculate in outline, mostly single and scattered over the thallus, rarely in groups of 2 (often lacking in leprose collections), sessile with a constricted base, average diameter 0.4–0.6 mm, maximum diameter 0.75–0.85 mm; disc (reddish) brown, matt or slightly glossy, flat to strongly convex, sometimes with a very thin whitish pruina (only visible when wet); *margin* weakly prominent when young, excluded in older apothecia, of the same colour or slightly lighter than disc; *exciple* colourless or pale yellow (–grey) within, outer parts, especially near hymenium, (orange-) brown, with minute, colourless or yellowish brown granules, more or less concolorous with epihymenium, laterally 40–85 µm, basally 90–125 µm wide, of strongly gelatinized, branched and anastomosing, radiating hyphae, inner cells with lumina 1.0–2.0 µm wide, apical cells slightly thickened (lumina 1–3 µm) when pigmented; *hypothecium* 135–150 µm high, colourless to weakly yellowish; *subhymenium* 65–95 µm high; *hymenium* 55–85 µm high, colourless; *epihymenium* 10–25 µm high, pale orange brown to (reddish) brown, composed of pigmented ends of paraphyses and small more or less colourless to pale ochre granules, sometimes streaking into the hymenium; *paraphyses* colourless below, moderately branched and anastomosing, lumina *c.* 1 µm, apically 1.0–2.5 µm wide; *ascospores* (11.5–) 12.7–14.2 (–15.5) × (5.0–) 6.0–6.9 (–8.0) µm.

Pycnidia not seen.

Chemistry. Thallus C –, K –, P –; secondary metabolite: lobaric acid.

Remarks. *Myochroidea porphyrospoda* is the only sorediate species of the genus. However, fertile specimens often lack soralia in large parts of their thalli and may be confused with *M. leprosula*. These two species can easily be distinguished by their secondary chemistry. *Myochroidea leprosula* contains fatty acids and reacts UV – while the UV +

white thallus of *M. porphyrospoda* contains lobaric acid. Lobaric acid is rather rare in corticolous crustose lichens. It is a rare accessory in *Japewia subaurifera* Muhr & Tønsberg, which is distinct from *M. porphyrospoda* by having soredia with yellow pigments (e.g., secalonic acid X2 and Z; Elix & Tønsberg 1999). *Protoparmelia oleagina* (Harm.) Coppins and *P. hypotremella* van Herk, Spier & V. Wirth both contain lobaric acid (*P. oleagina* often only in traces) but are esorediate and distinguished by lecanorine apothecia and characteristic appendages on the ascospores (e.g. Brodo & Aptroot 2005). *Myochroidea porphyrospoda* also shares the presence of lobaric acid with the recently described *Bacidia loabarica* Printzen & Tønsberg which, however, has pale green to yellowish green (never brown) soredia and a thallus that often appears completely leprose. Fertile specimens are easily distinguished from *M. porphyrospoda* by their needle-shaped ascospores. *Biatora lignimollis* T. Sprib. & Printzen ined. is another species with lobaric acid occurring as an epiphyte in moist forests of British Columbia. It is easily distinguished from *M. porphyrospoda* by its esorediate thallus, narrower ascospores and abundant, prominent pycnidia. The thallus of *Lecidea nylanderii* (Anzi) Th. Fr is UV+ white, but is greyish white, thin and more or less leprose and contains divaricatic acid. Fertile specimens of *L. nylanderii* can be distinguished from *M. porphyrospoda* by their globose ascospores. *Lecidea pullata* (Norman) Th. Fr. can be difficult to distinguish from *M. porphyrospoda* when sterile, but is characterized by punctiform soralia, a poorly developed corticate thallus and contains sphaerophorin instead of lobaric acid. When fertile, it can be distinguished by its bluish-black apothecia which recall those of *L. turgidula* Fr.

Distribution and ecology. *Myochroidea porphyrospoda* is widely distributed in Central and Northern Europe and Western North America, but apparently relatively rare. In addition to the collections cited below, it has been reported from Slovenia (Mrak *et al.* 2004), Portugal (van den Boom 2002),

Russia (Andreev *et al.* 1998) and NW Scotland (B. J. Coppins, pers. comm.). In Central Europe, it is known from the Alps, the Carpathians and the Bohemian Forest, where it grows at elevations between 1300 and 2270 m (see below and Hinteregger 1994). In Fennoscandia, *M. porphyrospoda* occurs from 70–1150 m. European collections were found growing on *Betula* sp., *Juniperus communis*, *Larix decidua*, *Picea abies*, *Pinus pumilio* and *Rhododendron ferrugineum*, and as far as can be deduced from label data, mostly close to the ground. In western North America, the species is known from Alaska, British Columbia, Idaho, Montana, Oregon, and Washington, where it was found on bases of *Rhododendron albiflorum* and *Vaccinium* spp., *Abies lasiocarpa*, *Pseudotsuga menziesii*, *Alnus rubra*, and corticolous on branches near the base of the trunk of *Castanopsis chrysophylla*. Like the other species of the genus, it seems to prefer mountain ranges with heavy winter snow-packs, such as the Cascades and wet interior mountain ranges (e.g., Selkirk Mountains) and has been collected at elevations between 930 and 2000 m. A specimen previously reported from British Columbia (Tønsberg 2002, see note under *Fuscidea lightfootii*) was re-examined and found to represent *M. leproso-lula*. This is thus the first correct report of *M. porphyrospoda* from Canada.

Selected specimens examined ($n=49$; for further localities see Hinteregger 1994 and Tønsberg 1992). **Austria:** Tirol: Ötztaler Alpen, im Längenthale bei Kùhthai, 47°11–12'N, 10°59'–11°01'E, on *Juniperus*, viii 1877, Arnold (M).—**Norway:** Hordaland: Granvin, Granvin, nær Spundsfooss, ix 1944, J. J. Havaas (UPS); Sogn og Fjordane, Lærdal, Revsnes, Hausen, UTM32V MN 075794, 70 m, on *Pinus sylvestris* bark, 1991, Anonby & Gaarder (BG). Nordland: Grane, just N of lake Smalvatnet, UTM: 33W, VN2221, 280 m, *Juniperus communis*, base, 1983, Tønsberg 8093 (UPS); Majavatn, open birch forest on E slope of Litlfjellet crest, 2.8 km SSE of the railway-station Majavatn, 65°08'47"N, 13°23'10"E, 500–510 m, branches of small *Picea* near ground, 2006, Palice 10748 (hb. Palice). Troms: Kvæfjord, E of Gullesfjorden, the WSW-facing slope E of Moelva, 68°34.32'N, 15°51.12'E, 270 m, corticolous on exposed root branch of *Betula pubescens*, 2006, Tønsberg 36905 (BG).—**Romania:** supra vallem "Valeriászka" (Retyezát), comit. Hunyad in Transsylvania, in cortice *Pinus pumilionis*, 12 viii 1883, Lojka [Lojka, Lich. Regni

Hung. exs.: 188] (B, M); Retezat, über dem Thale Valeriászka (Valereasca) im Retyezát Gebirge in Siebenbürgen, auf Krummholz, 12 viii 1883, Lojka [Zwackh-Holzhausen, W. von Lich. Exs.: 775] (B).—**Sweden:** Härjedalen: Svansjöfjellet, 1878, Hellbom (S); Midtadalen, Karlsvallen, 1867, Hellbom (S, UPS); Tinadalen vid Lupersvallen [?], 1878, Hellbom (S); Fjällnäs, Vrang (S). Jämtland: inter Storlien et Skurdal-sport, 25 vi 1914, Malme (S); Kall, St. Mjölkvatnet, Tjouren, S om an, död björk i granskog, 15 ix 1942, Ahlner (S); Snasahögen, 1873, Almqvist (S, UPS); Storlien, Skurdalshöjden, vi 1914, Malme (S); Undersåker, Vällista, vi 1914, Vrang (S, UPS). Torne Lappmark: Jukkasjärvi, Vassjaure Nat. vet. station, 02 viii 1905, Fries (UPS). Värmland: Munkfors, S. Brushöjden, björk, i O-slutten, mot bäck i skog, 1957, Sundell 1250 (UPS).—**Czech Republic:** S Bohemia: Sumava Mts., Volary, Mt. Plechi, light boggy spruce forest NW of "Rakouská louka" and NE of "Trojmezi", 48°46'30–40"N, 13°50'30–45"E, 1280–1320 m, dry bark of old *Picea*, 1998, Palice 1654 (hb. Palice).—**Finland:** Lapponia kittilensis: Kittilä, Levitunturi, ad corticem *Juniperi*, vii 1936, Koskinen (H).—**Germany:** Bayern: Bayerische Alpen, unweit der Hausstatalpe, Benedictenwand, on *Pinus pumilio*, 19 viii 1881, Arnold [Lich. exs.: 891] (FR).—**Canada:** British Columbia: Babine Mountains, Joe L'Orsa Cabin, 54°54.618'N, 126°53.183'W, on bases of dwarfed *Abies lasiocarpa* behind the cabin, 1501 m elev., 2006, Spribille 22366 (CANL); Selkirk Mts., Comaplix Mt., 50°51'12"N, 117°41'37"W, 1700 m, on *Abies lasiocarpa* branches close to ground level, 2005, Spribille 17510, 18295 (hb. Spribille); NE of New Denver, Goat Range, Dennis Creek trail, 50°04'46.37"N 117°18'57.77"W, on prostrate *Abies lasiocarpa* trunk in wet meadow, c. 2050 m, 2006, Spribille 20194 & C. Björk (hb. Spribille).—**USA:** Alaska: White Pass, T. Tønsberg 32850 (BG). Idaho: Bonner Co., trail to Lake Darling, at junction of Lake Darling and Callahan Creek trails, bark of large, sheltered *Abies*, 16 viii 2004, Spribille 15787 (hb. Spribille). Montana: Lincoln Co., Whitefish Range, Ten Lakes Scenic Area, cirque basin at head of Wolverine Creek, trail to Bluebird Lake, 48°57.404'N 114°55.642'W, on base of *Abies lasiocarpa* well below snow line, 2083 m, 2006, Spribille 20336 & Pérez-Ortega (hb. Spribille). Oregon: Wasco Co., S of Mt Hood, E of State Route 26 at Rd NFD 2640/Camas Prairie Rd intersection, 45°11.7'N, 121°41.4'W, alt. 1060–1070 m, corticolous on branches near base of trunk of *Castanopsis chrysophylla*, 2001, Tønsberg 29178, 29183 (BG). Washington: Lewis Co., Mt. Rainier Nat. Park, Stevens Canyon Road c. 400 m W of Box Canyon, 46°45'45"N, 121°38'15"W, c. 930 m, on bark of *Alnus rubra*, 1999, Printzen 5014 (FR); Pierce Co., Mt. Rainier Nat. Park, S slope of Sourdough Mountains, c. 400 m W of Sunrise Ranger Station, 46°54'50"N, 121°38'50"W, c. 1890 m, on bark of *Abies lasiocarpa*, 1999, Printzen 5007 (FR); Clallam Co., Olympic Nat. Park, Hurricane Hill summit, 47°59.452'N, 123°31.721'W, 1750 m, corticolous on branches of exposed dwarf specimens of *Abies amabilis*, 1999, Tønsberg 27966 (BG).

***Myochroidea rufofusca* (Anzi)
Printzen, T. Sprib. & Tønsberg, comb.
nov.**

Biatora rufofusca Anzi, *Cat. Lich. Sondr.*: 76 (1860); *Lecidea rufofusca* (Anzi) Nyl., *Flora* 52: 409 (1869); *Psora rufofusca* (Anzi) Räsänen, *Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo* 12(1): 149 (1939); type: [Italy, Lombardia,] In alpebus Bormiensibus, Lia, Rezzolungo, cum praecedente [= *Lecanora castanea* Hepp = *Bryonora castanea* (Hepp) Poelt] iisdem matricibus [ad gramina herbasque emortuas], sed rarior, [Anzi, *Lich. Lang. exs.* 178] (M—lectotypus, selected here; FR, O—isolectotypi).

Biatora porphyroplaca Hinteregger & Poelt in Hinteregger, *Bibliotheca Lichenologica* 55: 94 (1994); type: Austria, Vorarlberg, Verwall-Gruppe, Weg von der Thüringer Alpe auf den Birtschakopf, E-exponierte Felsabbrüche und Windheiden, c. 2010 m, auf *Rhododendron ferrugineum*, 26 July 1986, Hinteregger (GZU—holotypus).

(Fig. 1F)

Thallus crustose, poorly delimited, warted-areolate; areoles mostly more or less isodiametric, sometimes irregular in outline, (0.1–) 0.20–0.5 mm diam., weakly to strongly convex, often crenate and with proliferating, more or less elevated margins, rarely almost coralloid; surface matt, mouse grey to greyish brown; *photobiont* trebouxioid.

Apothecia rounded to flexuose in outline, rarely tuberculate, single or in groups of 2 or more, sessile with a constricted base, average diameter 0.4–0.7 mm, maximum diameter 0.5–1.2 (–1.4) mm; disc reddish or blackish brown, rarely ochre, matt or slightly glossy, flat to strongly convex, epruinose; *margin* distinct, but not or only weakly prominent, level with disc or excluded in older apothecia; *exciple* colourless to pale orange-brown within, outer parts, especially near hymenium orange to reddish brown, more or less concolorous with epihymenium, laterally 35–90 µm, basally 70–125 µm wide, excipular hyphae colourless within, lumina of excipular hyphae 1.0–2.5 µm wide, apical cells in part with brown cell walls, slightly to distinctly thickened (lumina 1.5–4.0 µm) when pigmented, colourless apical cells generally unthickened; *hypothecium* 70–150 (–200) µm high, colour-

less to weakly yellowish; *subhymenium* 35–95 µm high; *hymenium* 60–75 (–90) µm high, colourless; *epihymenium* 12–25 µm high, orange-brown to dark reddish brown, composed of paraphysis ends; *paraphyses* colourless below, weakly to moderately (mainly apically) branched and anastomosing, with lumina 0.7–1.0 µm, apical cells sometimes (not always) brown, with lumina 1–2 (–3) µm wide; *ascospores* (9.5–) 11.1–14.9 (–17.0) × (4.0–) 5.3–7.4 (–8.5) µm.

Pycnidia not seen.

Chemistry. Thallus C–, K– or possibly very faintly K+ yellowish, P–, UV+ yellow-orange; secondary metabolites: 3–4 xanthenes including 2,5,7-trichloro-3-O-methylnorlichexanthone (major).

Remarks. *Myochroidea rufofusca* was described from the Italian Alps. The original specimen grew on detritus and the name has consistently been used for terricolous and muscicolous material of this species (Fries 1874; Vainio 1934; Magnusson 1952; Foucard 2001). During the last decades, the species was largely ignored by Central European authors. Lettau (1954) was the last to report it—incorrectly—from soil in a spruce forest in Thuringia. After that, *Lecidea rufofusca* was mentioned only in a few checklists (Nimis 1993; Scholz 2000). Hinteregger and Poelt described *Biatora porphyroplaca* growing as a corticole and lignicole on twigs of *Rhododendron ferrugineum* in the Alps. They also mentioned that the species overgrows mosses at the base of twigs (Hinteregger 1994). We could not find any anatomical or chemical differences that would justify the distinction of two species and hence reduce *B. porphyroplaca* to synonymy.

The thallus of *M. rufofusca* is extremely variable with regard to colour and size of individual areoles. Thalli overgrowing detritus and bryophytes usually consist of strongly convex, sometimes almost isidiate areoles, while corticolous thalli may be reduced to widely scattered shallow areoles. Thallus colour ranges from almost pure white (in older thalli) to brown. In fresh

collections it is usually a piebald mixture of light pinkish brown and ochre. The apothecial margin is mostly only raised a little above the disc but in some Scandinavian collections the apothecia are flat and surrounded by a persisting prominent margin. Otherwise, these collections corresponded well to *M. rufofusca* as circumscribed here. In western North America *M. rufofusca* often grows side by side with *Biatora meiocarpa* var. *tacomensis* (Printzen & Tønsberg) Printzen & Tønsberg, which is chemically identical. That taxon has a pale to greenish grey thallus of flat or weakly convex areoles, pale ochre to orange-brown apothecia, a shallower hymenium (40–55 µm high), apically unpigmented paraphyses and excipular hyphae as well as narrower ascospores (3–5 µm wide). For the distinction from *M. leprosula* see under that species.

Distribution and ecology. *Myochroidea rufofusca* has so far been reported from the Alps, Portugal (van den Boom 2002), Fennoscandia, and Russia (Andreev *et al.* 1998). Previous reports from Colorado (Anderson 1964; Weber & Wittmann 1992) are based on misidentifications as the supporting material at COLO belongs to *Bilimbia microcarpa* Th. Fr., *Lecidella* sp. and another unidentified lecideoid lichen. These are thus the first correct reports for North America. In the European Alps, the species was recorded on twigs of *Rhododendron ferrugineum* and rarely on plant debris between 1880 and 3000 m elevation. In Fennoscandia and Greenland, the species is only known growing on detritus and bryophytes, generally near or above the tree-limit or in subarctic localities. The ecological amplitude of *M. rufofusca* seems to be widest in western North America, where it has been found on twigs of *Cassiope mertensiana*, *Phyllodoce empetrifomis*, *Rhododendron albiflorum*, and *Vaccinium membranaceum*, and bark of *Abies amabilis*, *A. lasiocarpa* and *Sorbus* sp. between c. 1400 and 2100 m elevation. However, unlike *M. leprosula* and *M. porphyrospoda*, which occur in true boreal habitats of northern British Columbia, there are no records of *M. rufofusca* north of the upper

limits of the hemiboreal zone (Tuhkanen 1984).

Selected specimens examined (n=65). **Austria:** Tirol: Lechtaler Alpen, road to Arlberg-pass, near St. Christoph am Arlberg, 47°07'35"N, 10°12'56"E, 1880 m, on *Rhododendron ferrugineum*, NE-exposed slope, 1986, *Hinteregger* [Obermayer *Lich. graec.*: 3] (M); [Ötztaler Alpen,] Ötztal, an Zweigen von *Rhododendron ferrugineum* im Zirbenwalde zwischen Gurgl und dem Gurgler Gletscher, 15 viii 1873, *Arnold* [*Lich. exs.* 545] (FR, GOET), in both cases together with isolecotype of *M. leprosula*; Ötztaler Alpen, Obergurgl, ridge "Brenner" 1–1.5 km SW of Obergurgl, 46°51'32"N, 11°00'53"E, 2000–2050 m, on *Rhododendron ferrugineum*, 2005, *Printzen* 9691a (FR).—**Canada:** British Columbia: Selkirk Mountains, Comaplix Mtn., 50°51'12"N, 117°41'37"W, 1700–1800 m, on stalks of *Cassiope mertensiana* at ground level, 2005, *Spribille* 17507 (CANL, hb. Spribille); Selkirk Mountains, Bad Shot Range, pass between Healy and Hall Creeks, 50°38'41"N 117°11'24"W, on bases of gnarled *Abies lasiocarpa*, 2000 m elev., 2006, *Spribille* 21552, *S. Abrahamczyk* & *V. Wagner* (CANL, COLO, GZU); Purcell Mountains, St. Mary's Alpine Provincial Park, trail to Mortar Lake, 49°51.461'N, 116°25.116'W, on *Rhododendron albiflorum* stalks, 2270 m, 2006, *Spribille* 19946 & *Wagner* (BG, mixed with *leprosula*), *Spribille* 19943 & *Wagner* (hb. Spribille); NE of New Denver, Goat Range, Dennis Creek trail, 50°04.889'N 117°19.132'W, on *Phyllodoce* branches in subalpine heath, 1954 m, 2006, *Spribille* 20023 & *Wagner* (hb. Spribille).—**Finland:** *Lapponia inarenensis*: Utsjoki, Koppeloivi, 1870, *Silén* 242 (H, H-Nyl 19908).—**Greenland:** Angmagssalik Distr., surroundings [of] King Oscars Havn, Qortortoq, 65°38'30"N, 37°37'30"W, 30 m, weathered rock, on slope with scarce subarctic vegetation, 1969, *Ferwerda* F 26-6 (B); Ikásaulaq fjord, E-side, halfway opposite Apusefajik glacier, 65°55'30"N, 37°20'W, 70 m, on sandy slope of snowpatch with litter and scarce subarctic vegetation, 1969, *Ferwerda* F 95-5 (B); Southeast Greenland, Møretun, 31.vii–2 viii, 1932, *Scholander* (O).—**Norway:** *Finnmark:* Berlevaag, 05 ix 1864, *Fries* (S, UPS), 24 vii 1920, *Lynge* (O); Alten, Kaafjord, 11 viii 1864, *Fries* (UPS); Maasøe, 18 vii 1864, *Fries* (S, UPS); Vadsø, Thomasdal, *Norman* (O, S, UPS). *Hordaland:* Eidfjord, Hardangervidda, N of Bjoreidalslytta, 60°19'N, 7°32'E, 1300 m, plant debris, on sandy ground, 1995, *Nordin* 4244 (UPS). *Oppland:* Sel, Slettin, 1290 m, 30 vii 1946, *Dahl* (O); Rondvassdalen, 1240 m, 27 vii 1946, *Dahl* (O); Rondane, Neverbuhøe, 1200 m, 25 vii 1946, *Dahl* (O). *Sogn og Fjordane:* along road between Aurland and Hol, the W-facing slope just NNE of Vestredalstjønnen, 60°44.9'N, 007°34.4'E, alt. 1150 m, corticolous on *Salix* in low alpine zone, 2000, *Tønsberg* 28470 (BG). *Telemark:* Grungedal, Haukelisetser, E of the hotel, on the southern slope N of the road, 1000 m, among mosses, on steep rocks to SW, 1978, *Moberg* 3712 (UPS). *Troms:* Kvæfordeidet pr. Rødmulldien, vi 1866, *Norman* (O, S);—**Portugal:** *Beira Alta:* Serra de Estrela, SSW of Manteigas, NNE

of top Cántaro Gordo, N exposed blockstream, 40° 19' N, 7° 36' W, 1850 m, shaded side of low granite, very shaded under overhang, 1995, *van den Boom* 17375 (hb. van den Boom).—**Sweden:** Jämtland: Åre, Mörvikshummeln, 06 viii 1909, *Vrang* (S); Snasahögen, 28 vii 1910, *Malme* (S); Sylarna, nära hyddan, 26 vii 1913, *Du Rietz* (S). *Lule Lappmark:* [Jokkmokk], Snjarrak, ovanför trädgränsen, 1864, *Hellbom* (S); Jokkmokk, Kvikkjokk, Snjerak, ovanför trädgränsen, 1864, *Hellbom* (UPS). *Torne Lappmark:* Jukkasjärvi, Abisko, E side Nuolja, near tree-limit, 07 vii 1919, *Magnusson* (S); Jukkasjärvi, Snuorratjakkko, 1000 m, 1921, *Magnusson* 5685 (S); Jukkasjärvi, Abisko, E side Nuolja, near tree-limit, 1919, *Magnusson* 2882 (UPS).—**USA:** Idaho: Bonner Co., trail to Lake Darling, western Cabinet Mtns., on *Vaccinium membranaceum*, 2004, *Spribille* 15840 (BG, hb. Spribille). Montana: Lincoln Co., Whitefish Range, Ten Lakes Scenic Area, Bluebird Lake, c. 200 m N of, 48° 56' 37" N, 114° 55' 55" W, 2028 m, corticolous on bases of small, 'krummholz' *Abies lasiocarpa*, 2006, *Spribille* 19909 & *Wagner* (hb. Spribille), *Spribille* 19910 & *Wagner* (hb. Spribille). Washington: Clallam Co., Olympic Nat. Park, Hurricane Ridge, paved trail between end of Hurricane Ridge Rd. and Hurricane Hill, 47° 59' 05" N, 123° 31' 46" W, c. 1600 m, on bark of *Abies amabilis*, 1999, *Printzen* 5317 (FR); Pierce Co., E of Mt. Rainier, Coyuse Pass, 46° 52' N, 121° 32' W, 1420 m, on *Sorbus*, 1994, *Tønsberg* 20351 (BG); Crystal Mt. Ridge, near summit 6872, 46° 56' N, 121° 30' W, 2060–2095 m, on *Abies lasiocarpa*, 1996, *Tønsberg* 24031 (BG); Mt. Rainier Nat. Park, c. 0.8 km N of Paradise, Skyline trail between Alta Vista and Glacier Vista, 46° 47' 40" N, 121° 44' 04" W, 1780 m, on twigs of *Phyllodoce empetriformis*, 1999, *Printzen* 5017 (FR); Mt. Rainier National Park, Reflection Lake W, 46° 46' N, 121° 44' W, alt. 1470 m, on *Vaccinium membranaceum*, 1994, *Tønsberg* 20318, 20319 (BG).

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